Orbiting Wide-angle Light-collectors (OWL)

Mechanical Subsystem

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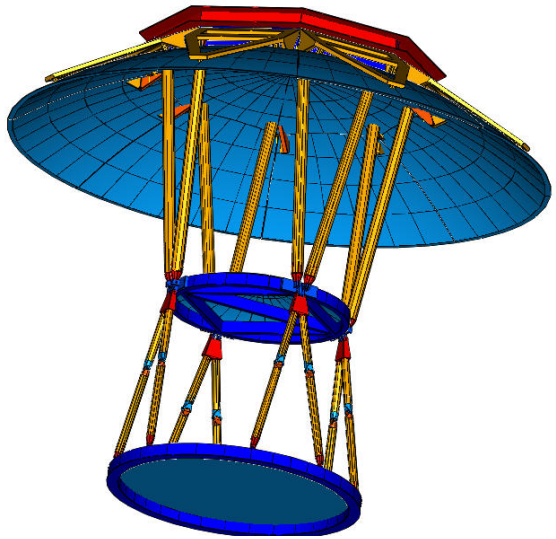
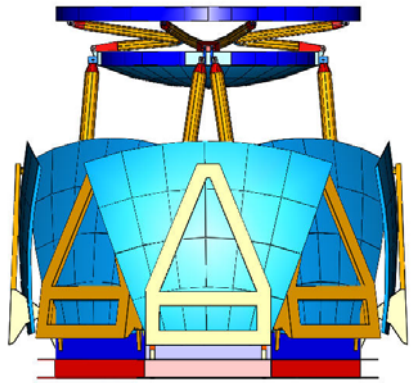
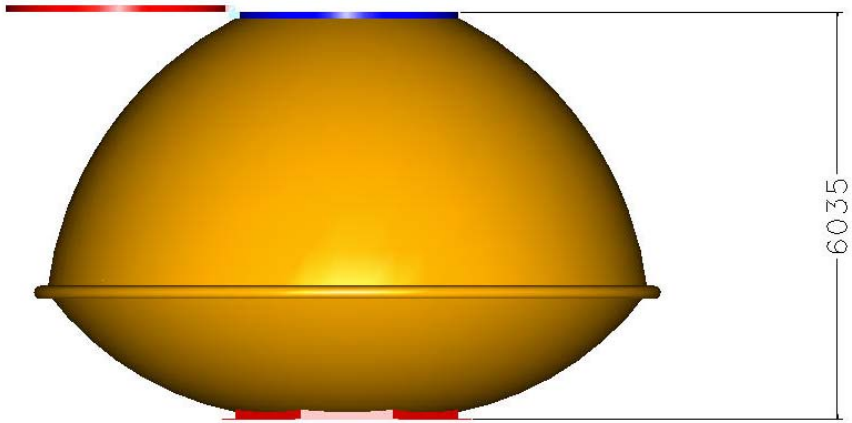
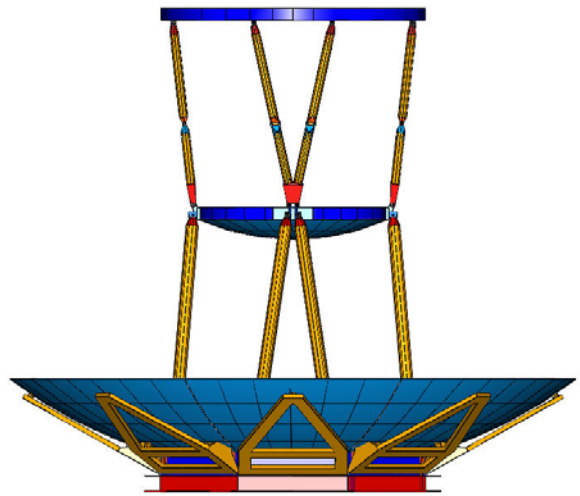
CAD Views of OWL







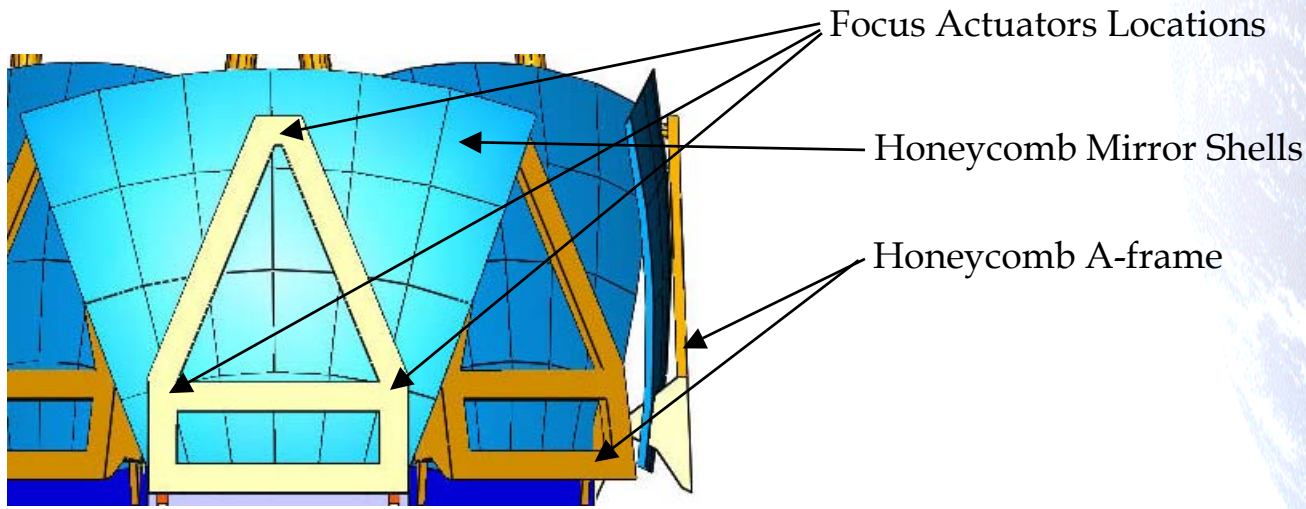


Major Items

- 8 deployable mirror petals + 1 fixed center shell
- A-frame support structures behind each deployed mirror petals
- Tip-tilt-focus adjustment actuators, 3 per deployed mirror petals
- Octagonal ring base structure, I/F to spacecraft bus
- Fixed detector plane support structure
- Deployable corrector plate support structure
- Inflatable light-tight, thermal-debris shield
- Articulating light-tight aperture cover (“lens cap”)
- Launch-lock and release mechanisms for petals, corrector, and lens cap
- Motorized deployments for petals, corrector
- Most materials will be low CTE composite graphite-cyanate ester

Primary Mirror

- Mirrored shells are 40 to 50 mm graphite composite honeycomb
- 3-point mounted to the honeycomb A-frame back-up structure
- Each of the 3 points has a ball-screw actuator connected via flexures
- Inner hinge point A-frame design
- Outer offset-hinge A-frame design



Detector plane and Corrector plate

Domed corrector in a geodesic mosaic structure for enormous strength with the least obscuration

Deployable corrector plate folding legs

Motorized hinge

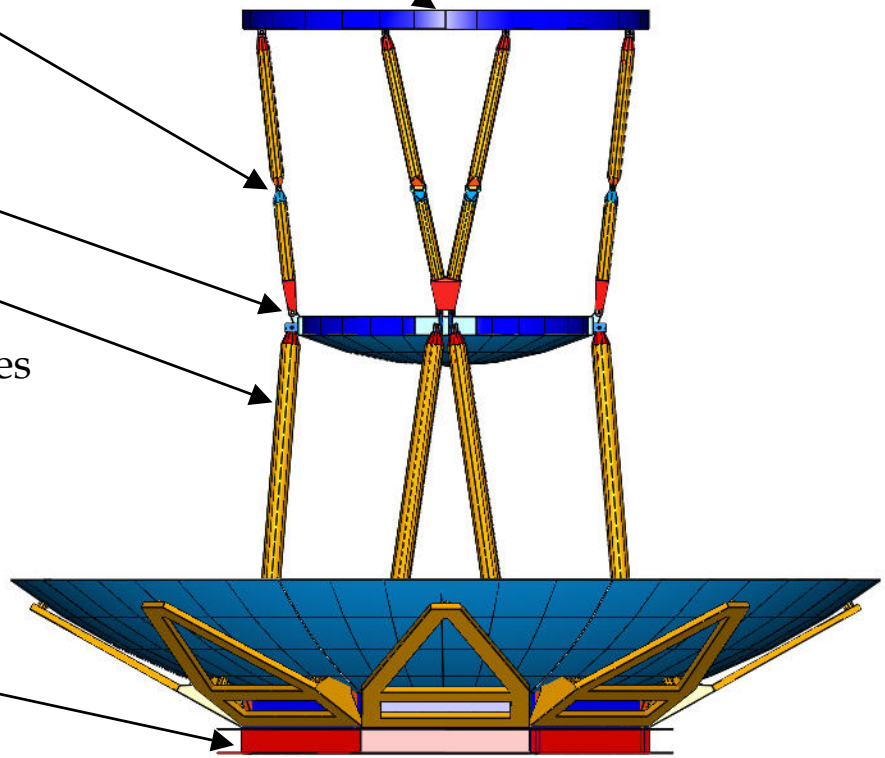
Fixed Detector Plane Supports

150mm diameter, 2mm wall tubes

Composite graphite

Inflatable light-tight debris shield containment box

S/C interface



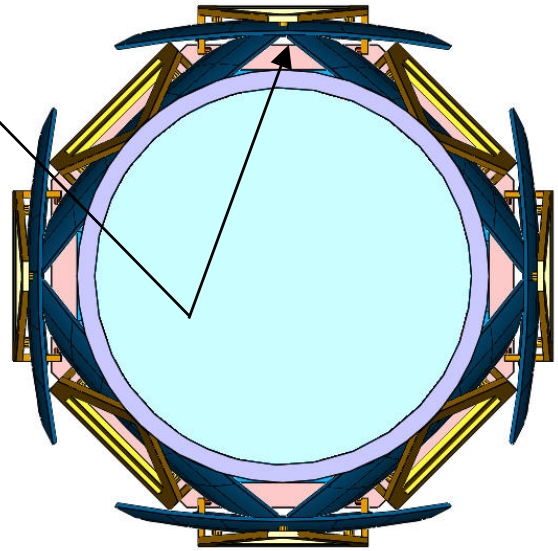
Deployment Systems

Mirror shells "hold hands" for launch. More actuators will be necessary for good load path and high natural vibration frequency

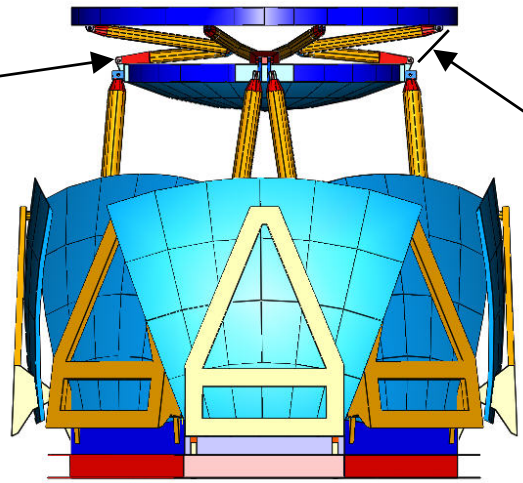
A-frames motor out sequentially

Latch motors pull A-frame into preloaded stops

3-way HOP launch lock, 4 places



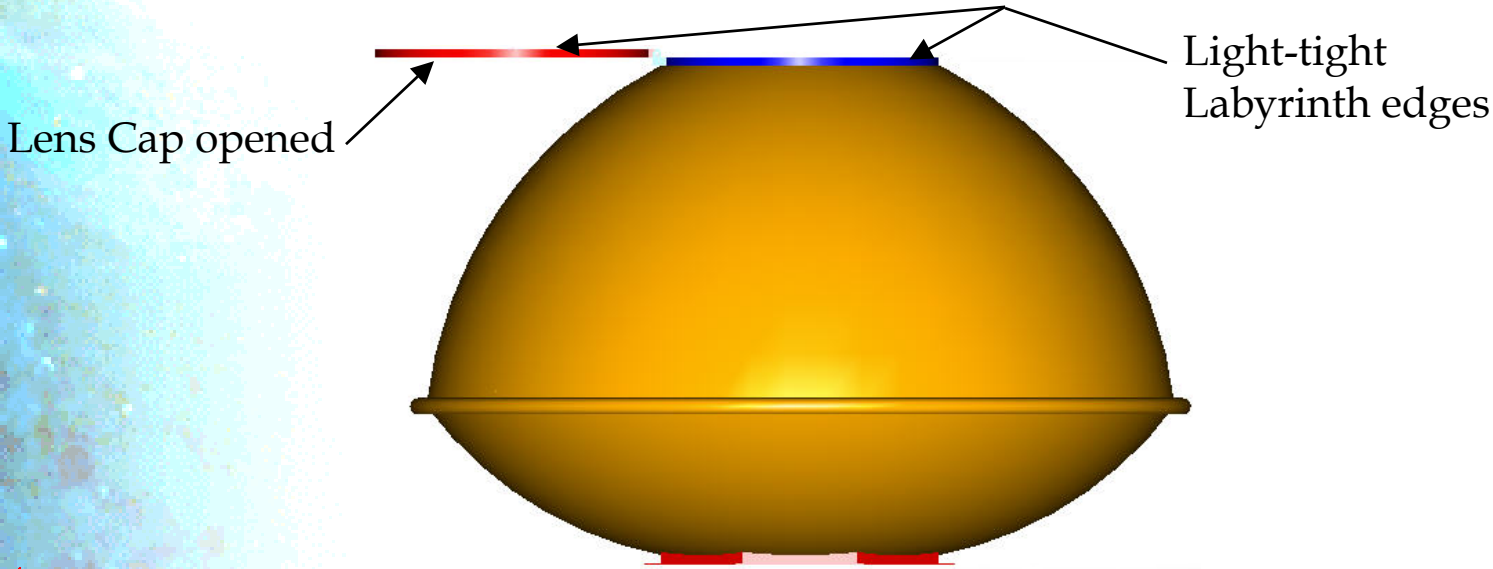
Motorized hinge raises the corrector plate



Launch lock stanchion not shown, 4 places

Inflatable light-tight debris shield

- Made of 10 layer MLI plus "bladder" plus micrometeoroid shield
- Shaped as a "jiffy-pop", with rigidized toroid and 8 ribs
- Mass of MLI ~ 60 kg
- Mass of micrometeoroid material ~ 50 kg
- Mass of titanium pressure tank ~ 11 kg, 300mm diameter, 9mm thick wall
- Total mass with plumbing, valves, and container box ~180 kg



Some Numbers

- 24 focus adjustment micron level actuators
- 8 petal deployment motors
- 8 petal latch motors
- 4 corrector plate deployment motors
- 1 lens cap motor
- 1 lens cap launch lock/reseal motor
- 8-10 inflation valve motor/solenoids
- 8 High Output Paraffin actuators for the inflated shield container
- 4-16 HOPs for the petal launch lock-release mechanisms
- 4 HOPs for the corrector plate launch lock-release mechanisms
- AND THEN THERE IS REDUNDANCY TO CONSIDER!!

- The Instrument Module ~ 2000+ kg
- Launch mass to 0 deg inclination 15000 km orbit is ~7000 kg